



## Sleep Apnea: A Primer for Dentists

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### Introduction

Obstructive sleep apnea (OSA) is a prevalent societal disorder with approximately 18 million Americans meeting the minimal diagnostic criteria. 80% of sufferers are undiagnosed.<sup>1</sup> Reviews show 9.2% prevalence of OSA in the general population.

OSA is related to a wide range of long term health problems such as hypertension, increased risk of stroke, arrhythmias, diabetes, and premature death from cardiovascular disease.<sup>2</sup> Short term effects include excessive daytime drowsiness which can result in significant negative events such as motor vehicle accidents.<sup>3</sup> Daytime drowsiness is of great concern in service members and could have fatal consequences in operational and combat situations. There has also been an increasing interest in OSA in service members, as the Veterans Administration has seen a 61% increase in the past 2 years in disability benefits for OSA, totaling over \$500 million/year. Veterans are four times more likely to suffer from OSA than the general US population.<sup>4</sup>

### What is sleep apnea?

There are three forms of sleep apnea: central, mixed, and obstructive (OSA). Central and mixed are both caused by dysfunction in the central nervous system which result in breathing disruption during sleep. These types of apnea are not normally managed utilizing oral devices. OSA will be the focus of this clinical update since it represents 85% of total sleep apnea cases and may be treated by dentists utilizing oral appliances.<sup>5</sup>

OSA is a condition in which the upper airway becomes blocked repeatedly during sleep causing a decrease in patient oxygen levels, resulting in frequent arousals from sleep to regain airway patency.<sup>6</sup> OSA is defined by two events: abnormal pauses in breathing greater than ten seconds (apnea) and temporary decreases in respiration which are unable to meet the patient's metabolic needs (hypopnea). Both of these cause patient arousal along with another type of event called respiratory effort related arousals (RERA). These arousals result in significant sleep disruptions and are related to the cardiovascular effects of apnea.<sup>7</sup>

### Pathophysiology

The primary causative event for OSA is collapse of the pharyngeal airway during sleep, but the underlying pathophysiology is complex. Factors involved in airway collapse include: airway anatomy, upper airway muscle activity and responsiveness, arousals, central nervous system activity/processing and a slight genetic component. Risk factors include: age, male sex and obesity.<sup>8</sup>

### Diagnosis

Diagnosis of sleep apnea must be provided by a physician. The test of choice for diagnosis is a polysomnogram which is a full night sleep study measuring multiple body functions occurring during sleep. The severity of sleep apnea is defined by the apnea/hypopnea index (AHI): the number of apneic and hypopneic events a patient has per hour. Mild cases range from 5-15/hr, moderate 15-29, and severe cases have 30+ events/hr.<sup>9</sup>

Excessive daytime sleepiness may be an indication of OSA. One measure of sleepiness is the Epworth Sleepiness Scale which evaluates sleepiness based on patient self-report, but is not specific for diagnosis of OSA. Another clinical tool is the Berlin Questionnaire which combines questions concerning snoring and sleep quality. While the questionnaire is a good screening tool, it does not have the required sensitivity and specificity to be utilized to diagnose OSA.

The dentist may play a key role in identifying various risk factors for OSA during history and physical exam. Patients can be asked about sleep

quality and snoring, which can be an indication of sleep apnea.<sup>10</sup> During a routine oral exam the dentist is able to view tissue obstruction in the throat, particularly while patients are in a prone position. Attention to obstructive risk factors such as a narrow pharynx relative to tongue size, retrognathia, and obesity are easily observed during exam. The upper airway can be classified utilizing the Mallampati score which is a predictor of OSA.<sup>11</sup> A neck measurement may also be taken quickly during examination, as a neck greater than 17.5" in diameter has been shown to be the most dependable risk factor for OSA.<sup>11</sup> Dentists can also play a prominent role in management of OSA.

### Management Options

**Behavior Management:** Weight loss, positional therapy in which the patient is instructed to sleep on their side, as well as avoidance of caffeine, alcohol, and heavy meals within two hours of sleep have shown to be effective in some patients.<sup>12</sup>

**CPAP:** The gold standard and American Academy of Sleep Medicine recommendation for OSA management is Continuous Positive Airway Pressure (CPAP). CPAP is delivered through a face-mask device which uses a continuous air flow to maintain airway patency during sleep. While very effective, CPAP is considered intolerable to wear by many patients and compliance is only 60-80%.<sup>13</sup> In addition, operational environments experienced by service members, such as ship and field conditions, are not conducive to CPAP use because the machine needs both an electrical source and space to function. The device also needs regular care and maintenance to continue functioning properly, which is not available during deployments. Approval of the Commanding Officer is required before taking CPAP on deployment<sup>14</sup>, making other management alternatives necessary in many circumstances faced by service members.

**Surgery:** There are several otolaryngologic and oral surgical procedures that are viable treatment options for OSA. Both a tonsillectomy and uvulopalatopharyngoplasty (UPPP) are surgical procedures used to remove excess tissue from the upper airway. While effective in some patients, results from these procedures have proven inconsistent.<sup>15</sup>

Oral and maxillofacial surgical procedures such as genioglossus advancement, hyoid suspension, and tongue base stabilization are also treatment options. Again the results have proven inconsistent.<sup>16</sup> A maxilla-mandibular advancement (MMA) via a LeFort I and bilateral sagittal split osteotomy (BSSO) is an extremely effective procedure, especially for patients with severe OSA.<sup>17</sup> Due to extensive nature of the surgery and the potential post-surgical morbidity, it is recommended that this treatment be limited to only severe cases of OSA.

**Oral Appliances:** An area of management in which dentists play a prominent role is oral appliance (OA) therapy. There is strong evidence based support for use of OA in OSA treatment. Studies have shown that appliances can decrease snoring and increase breathing in 95% of patients. While OA is usually recommended for mild to moderate OSA, having a 57-81% success rate, studies have also shown a 14-61% success rate for severe sleep apnea patients.<sup>18</sup> Most importantly, this treatment modality has higher patient compliance than CPAP.<sup>19</sup>

There are many oral appliances currently on the market. Most function by advancing the mandible, thereby holding the tongue and soft tissues forward. This prevents tissue collapse and increases airway space.

When choosing an appliance, it is important for the clinician to select from a list of FDA approved oral appliances which can be found at [http://www.ihatecpap.com/oral\\_appliance.html](http://www.ihatecpap.com/oral_appliance.html). Naval Area Dental Laboratories (ADL) may be able to support fabrication of some oral appliances for OSA management. These include mandibular advancement

devices and fixed upper and lower arch appliances. Please contact your ADL for further instructions on OA support.

Current training programs in Comprehensive Dentistry, Orofacial Pain and Prosthodontics at Naval Postgraduate Dental School include instruction in management of OSA with OA. While any dentist may fabricate oral appliances, it is highly recommended that practitioners seek additional training in OA therapy. Some in the health care community suggest that dentists complete the necessary training to become a Diplomate of the American Board of Dental Sleep Medicine before providing oral appliance therapy.<sup>19</sup>

Before fabricating any appliance, dentists must assess the patient for any underlying dental disease. All restorative dental treatment must be completed prior to OA fabrication. The patient must possess a minimum of 6 healthy, non-mobile, teeth per arch, and at least one posterior tooth per quadrant. The dentist must also look for signs of sleep bruxism, and consider if this would impact OA therapy.<sup>20</sup> The patient should be free of symptoms for temporomandibular disorders (TMD).

### Indications<sup>21</sup>

Indications for oral appliance therapy include, but are not limited to:

- 1) Primary snoring.
- 2) Mild OSA where behavioral management has proven unsuccessful.
- 3) Moderate to severe OSA in patients who cannot tolerate or refuse CPAP.
- 4) Patients who are not good surgical candidates.

### Contraindications<sup>21</sup>

Contraindications for oral appliance therapy include, but are not limited to:

- 1) Central or mixed sleep apnea.
- 2) Poor dental health or inadequate number of teeth to support an OA.
- 3) Active TMD/ orofacial pain.

### Side Effects

Several side effects may occur while wearing an OA. Many patients experience a temporary malocclusion on removal of the appliance in the morning. This is usually transient and resolves with jaw exercises, but a small number of patients may experience permanent occlusal changes. Most patients will experience hyper-salivation while wearing the OA. This should subside within one week of wear.<sup>21</sup> Other patients may experience muscular discomfort with OA wear, yet many patients report preferring this discomfort to that of using the CPAP.<sup>22</sup> Tenderness may be reduced by having the patient massage the muscle of mastication while applying moist heat after appliance removal. Other side effects include intraoral palatal, gingival, or dental soreness, temporomandibular joint soreness, obstruction of oral breathing caused by too bulky a device, mobility of anterior teeth, general tooth movement, and malocclusion.<sup>21</sup>

### Concluding remarks

Dentists should have a basic working knowledge of OSA and use of OA. Oral appliances can be an excellent option in management of OSA since they have demonstrated efficacy and have a high patient acceptance rate. The military dentist can provide a valuable service to our armed forces members who have OSA and are encouraged to seek the training and laboratory support to incorporate this important service into their practice.

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